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**CLAIMS**

1        1. A method of making a low-loss electromagnetic wave resonator structure

2        comprising:

3                providing a resonator structure, said resonator structure including a confining device

4        and a surrounding medium, said resonator structure supporting at least one resonant mode, said

5        resonant mode displaying a near-field pattern in the vicinity of said confining device and a far-

6        field radiation pattern away from said confining device, said surrounding medium supporting at

7        least one radiation channel into which said resonant mode can couple; and

8                specifically configuring said resonator structure to reduce or eliminate radiation loss

9        from said resonant mode into at least one of said radiation channels, while keeping the

10        characteristics of the near-field pattern substantially unchanged.

1        2. The method of claim 1, wherein said step of configuring comprises a modification

2        of said far-field pattern.

1        3. The method of claim 1, wherein said step of configuring comprises a modification

2        of the geometry or refractive index of said confining device.

1        4. The method of claim 3, wherein said modification has at least one plane of

2        symmetry.

1        5. The method of claim 3, wherein said modification has no plane of symmetry.

1        6. The method of claim 1, wherein said step of configuring comprises an introduction

2        of at least one nodal plane into said far-field pattern.

1           7. The method of claim 1, wherein said confining device operates using index  
2           confinement effects, photonic crystal band gap effects, or a combination of both.

1           8. The method of claim 1, wherein said surrounding medium is homogeneous.

1           9. The method of claim 1, wherein said surrounding medium is inhomogeneous.

1           10. The method of claim 1, wherein said radiation channels comprise superpositions of  
2           at least one spherical wave.

1           11. The method of claim 1, wherein said radiation channels comprise superpositions of  
2           at least one cylindrical wave.

1           12. The method of claim 1, wherein said confining device comprises a waveguide with  
2           a grating where said grating contains at least one defect.

1           13. The method of claim 12, wherein said step of configuring comprises modifying the  
2           dielectric constant of the grating.

1           14. The method of claim 12, wherein said step of configuring comprises modification  
2           of the local phase shift.

1           15. The method of claim 1, wherein said confining device comprises a waveguide  
2           microcavity.

1           16. The method of claim 1, wherein said confining device comprises a photonic crystal  
2           slab.

1        17. The method of claim 1, wherein said confining device comprises a disk resonator.

1        18. The method of claim 1, wherein said confining device comprises a ring resonator.

1        19. A method of making a low-loss electromagnetic wave resonator structure

2        comprising:

3                providing a resonator structure, said resonator structure including a confining device  
4        and a surrounding medium, said resonator structure supporting at least one resonant mode, said  
5        resonant mode displaying a near-field pattern in the vicinity of said confining device and a far-  
6        field radiation pattern away from said confining device, said surrounding medium supporting at  
7        least one radiation channel into which said resonant mode can couple; and

8                specifically configuring said resonator structure to increase radiation loss from said  
9        resonant mode into at least one of said radiation channels, while keeping the characteristics of  
10       the near-field pattern substantially unchanged.

1        20. The method of claim 19, wherein said radiation channel comprises of one or more

2        spatial directions.

1        21. A method of making a low-loss acoustic wave resonator structure comprising:

2                providing a resonator structure, said resonator structure including a confining device

3        and a surrounding medium, said resonator structure supporting at least one resonant mode, said  
4        resonant mode displaying a near-field pattern in the vicinity of said confining device and a far-  
5        field radiation pattern away from said confining device, said surrounding medium supporting at  
6        least one radiation channel into which said resonant mode can couple; and

7 specifically configuring said resonator structure to reduce or eliminate radiation loss  
8 from said resonant mode into at least one of said radiation channels, while keeping the  
9 characteristics of the near-field pattern substantially unchanged.

1 22. A method of designing a low-loss electronic wave resonator structure comprising:  
2 providing a resonator structure, said resonator structure including a confining device  
3 and a surrounding medium, said resonator structure supporting at least one resonant mode, said  
4 resonant mode displaying a near-field pattern in the vicinity of said confining device and a far-  
5 field radiation pattern away from said confining device, said surrounding medium supporting at  
6 least one radiation channel into which said resonant mode can couple; and  
7 specifically configuring said resonator structure to reduce or eliminate radiation loss  
8 from said resonant mode into at least one of said radiation channels, while keeping the  
9 characteristics of the near-field pattern substantially unchanged.

1 23. A method of making a low-loss acoustic wave resonator structure comprising:  
2 providing a resonator structure, said resonator structure including a confining device  
3 and a surrounding medium, said resonator structure supporting at least one resonant mode, said  
4 resonant mode displaying a near-field pattern in the vicinity of said confining device and a far-  
5 field radiation pattern away from said confining device, said surrounding medium supporting at  
6 least one radiation channel into which said resonant mode can couple; and  
7 specifically configuring said resonator structure to increase radiation loss from said  
8 resonant mode into at least one of said radiation channels, while keeping the characteristics of  
9 the near-field pattern substantially unchanged.

1           24. The method of claim 23, wherein said radiation channel comprises of one or  
2           more spatial directions.

1           25. A method of making a low-loss electronic wave resonator structure comprising:  
2           providing a resonator structure, said resonator structure including a confining device  
3           and a surrounding medium, said resonator structure supporting at least one resonant mode, said  
4           resonant mode displaying a near-field pattern in the vicinity of said confining device and a far-  
5           field radiation pattern away from said confining device, said surrounding medium supporting at  
6           least one radiation channel into which said resonant mode can couple; and  
7           specifically configuring said resonator structure to increase radiation loss from said  
8           resonant mode into at least one of said radiation channels, while keeping the characteristics of  
9           the near-field pattern substantially unchanged.

1           26. The method of claim 25, wherein said radiation channel comprises of one or more  
2           spatial directions.